

Relationship between the stability and surface tension of the tear film

A. Puinhas, E.M.S. Castanheira, M. Elisabete C.D. Real Oliveira and M. Lira

Centre of Physics (CFUM), University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal.

Tear film properties are important factors in the use of contact lenses. In this work, the stability and surface tension of the tear film were evaluated, analyzing also the correlation between these parameters, with measurements taken in the morning and afternoon.

Twenty healthy and young individuals, without dry eye symptoms, were included in the study, with an average age of 24 ± 2.5 years. In a controlled laboratory setting, on the same day for each individual, morning and afternoon Non Invasive Break Up Time (NIBUT) measurements were performed with a Tearscope Plus equipment.

Tear samples were collected with microcapillarity tubes and stored at -80°C . The surface tension was determined through Langmuir isotherms. Surface pressure vs. area profiles were sigmoidal and showed hysteresis between the expansion and compression phases of the cycle.

Tear film stability showed no significant differences between the left and right eye, but exhibited distinct NIBUT values between morning and afternoon, with mean values of $(17 \pm 22.3 \text{ s})$ and $(12.79 \pm 4.25 \text{ s})$, respectively, this difference being statistically significant ($p=0.000$).

Langmuir isotherms show that the tear surface tension is higher in the afternoon compared to the morning sample of the same individual. Besides, tear film stability was significantly reduced at the end of the day ($p=0.000$). The tear film stability decreases when the surface tension increases, showing that tear components with surface activity (proteins and lipids) are important factors in the tear film stability properties. These results indicate that the surfactants content of the tear film decreases at the end of the day.